11.220 Quantitative Reasoning & Statistical Methods for Planners I
Spring 2009

Quantitative Reasoning and Statistical Methods

Ezra Glenn

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	Immunization	No Immunization	Total
Before	56	144	200
After	34	166	200

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"Before" Sample:

$$\begin{cases} \hat{p}_b = 56 \div 200 = .28 \\ se_b = \frac{\sqrt{.28 \times .78}}{\sqrt{200}} = 0.0330 \end{cases} \tag{1}$$

"After" Sample:

$$\begin{cases} \hat{p}_a = 34 \div 200 = .17 \\ se_a = \frac{\sqrt{.17 \times .83}}{\sqrt{200}} = 0.0266 \end{cases} \tag{2}$$

Pooled Error:

$$se_d = \sqrt{.0330^2 + .0266^2} = 0.0424 \tag{3}$$

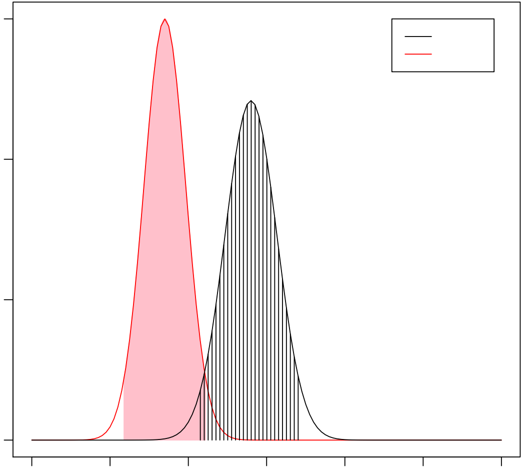
$$\begin{cases} \hat{p}_b = 0.28 \\ \hat{p}_a = 0.17 \\ se_d = 0.0424 \end{cases} \tag{4}$$

Then use t-statistic:

$$t = \frac{\hat{p}_b - \hat{p}_a}{se_d} = \frac{.28 - .17}{.0424} = 2.59 \tag{5}$$

which exceeds our t-critical for df=398.

$\therefore$ we can reject H_0 (i.e., we can conclude that the difference is significant)



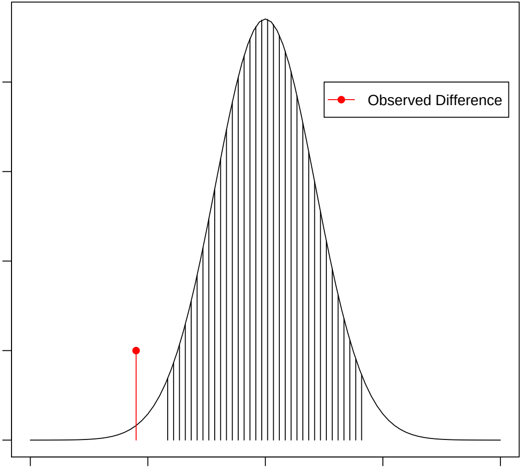

Observed Difference

Table: All Respondents

	Immunization	No Immunization	Total
Before	56	144	200
After	34	166	200

From 28% down to 17%

Table: With Health Insurance

	Imm.	No Imm.	Total
Before	48	10	58
After	6	1	7

From 83% *up* to 85%

Table: Without Health Insurance

	Imm.	No Imm.	Total
Before	8	134	142
After	28	165	193

From 5.6% *up* to 17%

You could also now test each of these for significance. . .

Table: Observed Counts ($n = 60$)

	1	2	3	4	5	6
count	14	8	8	8	8	14

Table: Observed Counts ($n = 60$)

	1	2	3	4	5	6
count	14	8	8	8	8	14

Table: Expected Counts ($n = 60$)

	1	2	3	4	5	6
count	10	10	10	10	10	10

Table: Observed-Expected Counts

	1	2	3	4	5	6	total
observed	14	8	8	8	8	14	60
expected	10	10	10	10	10	10	60

$$\chi^2 = \Sigma \frac{(observed - expected)^2}{expected}$$

$$\frac{4^2}{10} + \frac{2^2}{10} + \frac{2^2}{10} + \frac{2^2}{10} + \frac{2^2}{10} + \frac{4^2}{10} =$$

$$2 \times 1.6 + 4 \times .4 =$$

$$3.2 + 1.6 = 4.8$$

From table: $\chi^2_{critical} \geq 11.07$ (5 df, $\alpha = .05$, two-tailed).
$4.8 < 11.07, \therefore$ we cannot reject H_0

Table: DUSP Applications, Observed (2008)

	CDD	IDG	EPP	HCED	Total
non-minority applicants	98	70	40	43	251
minority applicants	16	6	5	23	50
total applicants	114	76	45	66	301

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	CDD	IDG	EPP	HCED	Total
non-minority applicants	98	70	40	43	251
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total applicants	114	76	45	66	301

Table: DUSP Applications, Expected (2008)

	CDD	IDG	EPP	HCED	Total
Non-minority	95.06	63.38	37.52	55.04	251
Minority	18.94	12.62	7.48	10.96	50
Total	114	76	45	66	301

Table: DUSP $\frac{(Observed - Expected)^2}{Expected}$ Cell Contributions

	CDD	IDG	EPP	HCED
Non-minority	0.09	0.69	0.16	2.63
Minority	0.46	3.48	0.82	13.21

$\chi^2 = 0.09 + 0.69 + 0.16 + 2.63 + 0.46 + 3.48 + 0.82 + 13.21 = 21.54$
$df = 3$, significant at $p < .001$

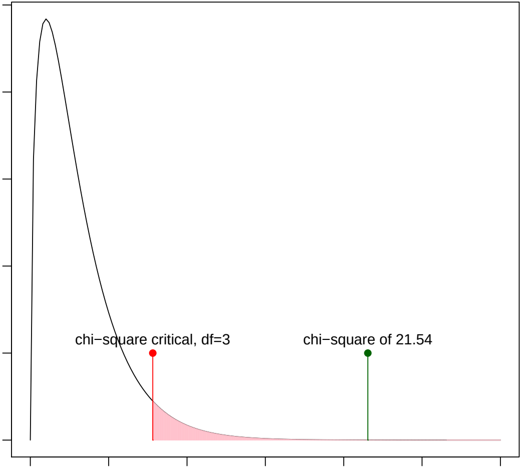
chi−square critical, df=3
chi−square of 21.54

Table: DUSP Applications, Observed (2008)

	CDD	IDG	EPP	Total
non-minority applicants	98	70	40	208
minority applicants	16	6	5	27
total applicants	114	76	45	235

Table: DUSP Applications, Expected (2008)

	CDD	IDG	EPP	Total
Non-minority	100.90	67.27	39.83	208
Minority	13.10	8.73	5.17	27
Total	114	76	45	235

Table: DUSP Applications, Expected (2008)

	CDD	IDG	EPP	Total
Non-minority	100.90	67.27	39.83	208
Minority	13.10	8.73	5.17	27
Total	114	76	45	235

Table: DUSP $\frac{(Observed - Expected)^2}{Expected}$ Cell Contributions

	CDD	IDG	EPP
Non-minority	0.08	0.11	0.00
Minority	0.64	0.85	0.01

$\chi^2 = 1.7$
$df = 2$, not significant at $p < .05$